SIXTH SEMI-ANNUAL REPORT

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RESEARCH SUPPORT FOR CADMIUM TELLURIDE CRYSTAL GROWTH

Period of Performace
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General Status

During this reporting period work has been reduced to a low level consistent with our request for a no-cost extension of this project.

1. Chemical Impurity Characterization

1.1 Task

Electronically active impurities (to be specified in consultation with MSFC personnel in the course of this research) are to be determined by atomic absorption spectroscopy. This includes determination of the most advantageous procedures with respect to sensitivity and accuracy for the selected elements in the CdTe host material. Errors and interferences resulting from dissolution and host elements, respectively, are to be determined through analysis of solvents, matrix matching and standard addition techniques.

1.2 Work Performed

No work has been performed on this task.

2. Mass Spectroscopy

2.1 Task

The release of impurities from various commercially available silica glasses at temperatures up to their softening range is to be investigated by mass spectroscopy. This will provide guidance in the choice of appropriate crystal growth ampoule materials and in the design of vacuum bake-out and seal-off procedures that minimize the contamination of the crystal growth materials. This analysis will also provide some guidance in the choice of specific elements to be analyzed for by atomic absorption spectroscopy (Task 1).

2.2 Work Performed

The addition of the two perforated plates between the effusion furnace and the mass spectrometer has appeared to stop the calibration shifts during sample heating. We have continued to calibrate the mass spectrometer system using a carbon monoxide/nitrogen gas mixture. We have had some problems with the precision and reliability of the gas control valves. We are in the process of changing these valves. In addition, we have disassembled and cleaned the formation chamber of the mass spectrometer.

We have found and are preparing to incorporate a much smaller "furnace" for heating the silica glass samples. This heater consists of a pyrolytic boron nitride encapsulated graphite heater. The maximum (in vacuum) service temperature of this heater is 2000°C which is well below our requirements and above the capabilities of the present tantalum wire furnace. In addition, the heaters surface area is about 1/30 of the present furnace. This should greatly reduce both the time and amount of outgassing required in the present arrangement. Also, we do not believe that water cooling will be necessary for this heater. The cost of this heater is about $1,500, which is equal to the cost of rewiring the heating elements in the present furnace. During the next reporting period we expect to incorporate this heater into the mass spectrometer.